REMARKS

Claims 9-11, and 25-37 are currently pending in this application. By this amendment, claims 29 and 32 have been amended. Of the currently pending claims, claims 9, 29, and 32 are independent. Applicant respectfully submits that the above amendments do not add new matter to the application and are fully supported by the specification.

In view of the above amendments and the following Remarks, Applicant respectfully requests reconsideration and timely withdrawal of the pending objections and rejections for the reasons discussed below.

Claim Objection

In the Office Action, claims 29 and 32 were objected to as requiring the insertion of "a" before carbon foam to conform with US patent practice.

Claims 29 and 32 have been amended to include "a" before – carbon foam – as requested by the Examiner. This amendment is not made for the purpose of avoiding prior art or narrowing the claimed invention, and no change in claim scope is intended. Therefore Applicants do not intend to relinquish any subject matter by these amendments. Applicant respectfully submits that claims 29 and 32, as amended, overcomes the stated objection. Accordingly, Applicants respectfully request withdrawal of the objection for claims 29 and 32.

Introductory Remarks

Applicant's claimed invention is directed to carbon foam having a unique combination of properties that allow it to be used as a radar emissions absorbing material. In particular, the

claimed invention is directed to carbon foam having the combination of a dielectric constant in the range of about 2 to about 6 and an electrical resistivity in the range of about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm. It is this combination of properties for carbon foam that demonstrate excellent radar emission absorptivity in the megahertz and gigahertz ranges. For example, in the specification it recites,

> carbon foams exhibiting a dielectric constant of from about 2 to about 6 and simultaneously an electrical resistivity in the range of between about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm, demonstrate excellent radar emission absorptivity in the megaherz and gigaherz ranges.
>
> *Specification* at page 4, lines 20-23.

As discussed in the prior reply, not all carbon foams have the same properties or combination of properties. For example, depending upon processing conditions, the properties of carbon foam can vary. This is exemplified in Figure 2 of Applicant's specification where the same type of green foam (coal-based green foam) was calcined at different temperatures. Figure 2 clearly illustrates how the electrical resistivity for resulting carbon foam changes over a wide range of calcining soaking temperatures. As can be seen in Figure 2, as the carbon foam soaking temperature increases from 0° to 3000°C, the electrical resistivity of the carbon foam decreases from $10E^{+07}$ to $10E^{-02}$ ohm-cm.

Figure 2 can be broken down into three distinct regions. Comparison of each of these regions illustrate the changing and differing properties of carbon foam treated at different calcining temperatures. The first region represents carbon foams that have been heat treated above 800°C. According to Figure 2, these carbon foams exhibit electrical resistivities below about $1E^{-01}$ ohm-cm. The second region represents carbon foams that have been heat treated at

temperatures ranging from 600°C to 800°C. According to Figure 2, carbon foams heat treated at temperatures ranging from 600°C to 800°C exhibit electrical resistivities ranging from about $1E^{+00}$ to about $1E^{+06}$ ohm-cm. The third region represent carbon foams that have been heat treated below 600°C. Carbon foams heat treated in this region exhibit electrical resistivities above $1E^{+06}$. Figure 2 clearly illustrates that based upon the calcining heat treatment for green carbon foam, the electrical resistivity for the carbon foam will vary. As Figure 2, clearly illustrates, not all carbon foams have the same electrical resistivity.

Embodiments of Applicant's claimed invention is directed to carbon foams that fall within the second region of Figure 2, i.e., carbon foams exhibiting an electrical resistivity ranging from about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm.

Electrical resistivity is only part of the invention. The additional component to applicants claimed invention is that the carbon foam have a dielectric constant ranging from about 2 to about 6 in combination with the claimed electrical resistivity. It is this combination of properties that provide a carbon foam that demonstrate excellent radar emission absorptivity in the megaherz and gigaherz ranges. *Id.* The specification teaches that the dielectric constant changes based on the processing conditions of the carbon foam. *Specification* at page 4, lines 6-18. The specification teaches that to get the claimed combination of electrical resistivity and dielectric constant, the carbon foam is heat treated in a relatively narrow range of from about 600°C to about 800°C. Attainment of the desired combination of dielectric constant (reactance) and resistivity is achieved after soaking at these temperatures for only a matter of minutes, preferably from about 2 to about 30 minutes under an inert gas. *Specification* at page 4, line 20 – page 5, line 8.

As will be discussed below, none of the cited references teach, suggest, or provide motivation for a carbon foam having the combination of a dielectric constant from about 2 to about 6 and an electrical resistivity from about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm as required by claims 9-11, and 25-37.

Rejections Under 35 U.S.C. § 103 – McCullough in view of JP '057

Claims 29-33, and 37 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U. S. Patent No. 4,999,385 issued to McCullough, Jr., *et al.* ("McCullough") in view of JP 09-087057 to Nakano Satoshi ("JP'057"). Applicants respectfully traverse this rejection for at least the following reasons and requests reconsideration.

The Office Action takes the position that "McCullough teaches a flame retardant article suitable as an electrical shielding or a fire barrier comprising a carbon foam having a resistivity from 10 to 10^3 [ohm-cm] and a density from 0.25 to 12 pcf with the claimed ranges." *Office Action*, page 2. Further the Office Action states that "McCullough does not specifically disclose and electrical resistivity." Applicant believes that Examiner meant to refer to dielectric constant. To supply this missing limitation, the Office Action states that "JP'057 teaches a wave absorber having a dielectric constant from 2 to 8." *Office Action*, page 3. "Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the electrical shielding of McCullough having a dielectric constant as taught by JP'057 because it has been shown in the art that such is an acceptable range for a dielectric constant of the electrical shielding." *Id.*. Applicant respectfully disagrees and submits that a *prima facie* case of obviousness has not been made.

Claims 29 and 32 require a carbon foam having an electrical resistivity in the range of about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm in combination with a dielectric constant in the range of about 2 to about 6.

Turning to McCullough, McCullough discloses preparing polyacrylonitrile based polymer foams, heat treating the polymer foams, and measuring their electrical resistivites. McCullough discloses heat treating these foams between 175° and 1500°C. *McCullough*, col. 4, ll. 31-34. In particular, McCullough discussed three groups of carbon foams. Group one was classified as electrically nonconductive. Foams with a nitrogen content of about 20% or more are electrically nonconductive with electrical resistivities greater than 10^3 ohm-cm, and typically greater than 10^7 ohm-cm. *Id.* at col. 4, ll. 35-46. Group two was classified as having low conductivities with specific resistance of about 10^3 to 10^1 ohm-cm. *Id.* at col. 4, ll. 47-54. For groups one and two, no information was provided with respect to dielectric constant, heat treatment temperatures, or treatment times. A third group was identified as being highly electrically conductive with specific resistance of less than 10^1 ohm-cm. This group is heat treated above about 750°C for a period of time to increase the carbon content. *Id.* at col. 4, ll. 55-63. No information was provided with respect to dielectric constant.

To supply this missing limitation, the Examiner relies on JP '057. First, JP '057 is a different material than that of McCullough. As discussed above, McCullough is directed to carbon foams prepared from polyacrylonitrile. JP '057 is directed to a foam material that is prepared by adding a filler to a synthetic resin and then foamed. *JP '057*, Abstract. There is no guidance or teaching just how McCullough could be modified by JP '057 to provide a carbon foam that has the combination of an electrical resistivity in the range of about $1.E^{+00}$ ohm-cm to

about $1.E^{+06}$ ohm-cm and a dielectric constant in the range of about 2 to about 6 as required by claims 29 and 32.

JP '057 teaches that filler material is added to the resin. There is no guidance or expectation of success that adding a filler to the foam in McCullough would produce a carbon foam having an electrical resistivity in the range of about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm and a dielectric constant in the range of about 2 to about 6. Indeed JP '057 discloses that the addition of graphite as a filler makes the material more conductive and the addition of a metallic oxide makes the material more insulating. Assuming *arguendo* that adding any of these fillers to McCullough would provide the appropriate dielectric constant, there is no guidance as to how the addition of these fillers would affect the electrical resitivity of the material. There is simply no guidance as how to modify McCullough with the teachings of JP'057 to provide a carbon foam having an electrical resistivity in the range of about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm and a dielectric constant in the range of about 2 to about 6 as required by claims 29 and 32.

Further, there is no indication in McCullough or JP '057 that the combination of a particular electrical resistivity and particular dielectric constant for a carbon foam is possible or even desirable. This combination of properties for a carbon foam can only come from Applicant's specification.

Applicant respectfully submits that a *prima facie* case of obvious has not been made. Accordingly, Applicants respectfully request withdrawal of the 35 U.S.C. §103(a) rejection of claims 29-33, and 37.

Rejections Under 35 U.S.C. § 103 – JP '057 in view of McCullough

Claims 9, 25-34, 36 and 37 stand rejected under 35 U.S.C. §103(a) as being unpatentable over JP 09-087057 to Nakano Satoshi ("JP '057") in view of U. S. Patent No. 4,999,385 issued to McCullough, Jr., *et al.* ("McCullough"). Applicants respectfully traverse this rejection for at least the following reasons and requests reconsideration.

The Office Action states that JP'057 teaches a wave absorber comprising a carbonaceous foam having a dielectric constant and density within the claimed ranges." *Office Action*, page 3. The Office Action acknowledges that JP '057 does not disclose the claimed electrical resistivity range. *Id.* Further, the Office Action indicates that JP'057 teaches an "electrical resistivity can be modified as dependent upon the specific applications of the foam (paragraph 38)." *Office Action*, pages 3-4. To supply the missing electrical conductivity limitation, the Office Action cites to McCullough as teaching "a flame retardant article suitable as an electrical shielding [sic] comprising a carbon foam could have an electrical resistivity of 10 ohm-cm." *Office Action*, page 4. The Examiner concludes that "it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the carbon foam having an electrical resistivity of 10 ohm-cm because as shown in the art it is possible and acceptable for the wave absorbers to have an electrical resistivity of 10 ohm-cm." *Id.* Applicant respectfully disagrees and submits that a *prima facie* case of obviousness has not been made.

Claims 9, 29, and 32 each require a combination of electrical resistivity and dielectric constant. In particular, claim 9 recites "a carbonized foam which exhibits a dielectric constant in the range of about 2 to about 6 and an electrical resistivity in the range of about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm." Claim 29 recites, "carbon foam has the properties of a dielectric constant

in the range of about 2 to about 6 and an electrical resistivity in the range of about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm." Claim 32 recites, "a carbon foam having a dielectric constant from about 2 to about 6 and an electrical resistivity from about $1.E^{+00}$ ohm-cm to about $1.E^{+06}$ ohm-cm."

JP '057 is directed to a foam material that is prepared by adding a filler to a synthetic resin and then foamed and that the materials can have a dielectric constant of 2-8. JP '057, Abstract. The Examiner acknowledges that JP '057 fails to disclose a carbon foam having an electrical resistivity in the ranges claimed in claims 9, 29, and 32. *Office Action*, page 3.

To supply this missing limitation, the Examiner relies on McCullough stating that it would be obvious "to use the carbon foam having an electrical resistivity of 10 ohm-cm because as shown in the art it is possible and acceptable for the wave absorbers to have an electrical resistivity of 10 ohm-cm." As discussed previously, McCullough is a different material than the material discussed and characterized in JP '057. It is not clear that the material in JP '057 would exhibit the appropriate dielectric constant if the material were substituted with the foam in McCullough that exhibits an electrical resistivity in the claimed range. Further, it is not clear that the foam of McCullough would continue to have an electrical resistivity if used in conjunction with the fillers and treatment taught in JP '057. As discussed above, given that these are different materials, one with filler products contained therein and one derived from a polyacrylonitrile foam, there is no evidence that the proposed combination would produce a carbon foam with the combination of electrical resistivity and dielectric constant as claimed in claims 9, 29, and 32. Further, as discussed above, there is no indication in McCullough or JP '057 that the combination of a particular electrical resistivity and particular dielectric constant

for a carbon foam is possible or even desirable. This combination of properties only comes from Applicant's specification.

Applicant respectfully submits that a *prima facie* case of obvious has not been made. Accordingly, Applicants respectfully request withdrawal of the 35 U.S.C. §103(a) rejection of claims 9, 25-34, 36 and 37.

Rejections Under 35 U.S.C. § 103 – JP '057 in view of McCullough, in further view of Rogers

Claims 10, 11, and 35 stand rejected under 35 U.S.C. §103(a) as being unpatentable over JP 09-087057 to Nakano Satoshi ("JP '057") in view of U. S. Patent No. 4,999,385 issued to McCullough, Jr., *et al.* ("McCullough") as applied to claims 9 and 34, further in view of U. S. Patent No. 6,656,238 issued to Rogers, *et al.* ("Rogers") Applicants respectfully traverse this rejection for at least the following reasons and requests reconsideration.

Claims 10 and 11 depend from independent claim 9. Claim 35 depends from claim 34 which in turn depends from independent claim 32. As discussed above, Applicant respectfully submits that the combination of JP '057 in view of McCullough as applied to claims 9 and 32 does not establish a *prima facie* case of obviousness.

As discussed previously, it is not clear that the material in JP '057 would exhibit the appropriate dielectric constant if the material were substituted with the foam in McCullough that exhibits an electrical resistivity in the claimed range. Further, it is not clear that the foam of McCullough would continue to have an electrical resistivity if used in conjunction with the fillers and treatment taught in JP '057. As discussed above, given that these are different materials, one with filler products contained therein and one derived from a polyacrylonitrile foam, there is no

evidence that the proposed combination would produce a carbon foam with the combination of electrical resistivity and dielectric constant as claimed in claims 9, 29, and 32. Further, as discussed above, there is no indication in McCullough or JP '057 that the combination of a particular electrical resistivity and particular dielectric constant for a carbon foam is possible or even desirable. This combination of properties only comes from Applicant's specification.

The addition of Rogers does not cure this deficiency. As acknowledged by the Examiner in the Office Action, there is no basis for the Rogers carbon foam to inherently attain the claimed combination of electrical resistivity and dielectric constant. Office Action, page 6.

Accordingly for the reasons claims 9 and 32 are not obvious over the combination of JP '057 in view of McCullough. Dependent claims 10, 11, and 35 are not obvious over JP '057 in view of McCullough, in further view of Rogers. Applicant respectfully submits that a *prima facie* case of obvious has not been made. Accordingly, Applicants respectfully request withdrawal of the 35 U.S.C. §103(a) rejection of claims 10, 11, and 35.

Extension of Time

A Petition for a three (3)-month extension of time under 37 C.F.R. §1.136(a) is filed herewith extending the period for response through February 2, 2007. It is not believed that any further extensions of time are required other than those in the accompanying Petition. If extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned for under 37 C.F.R. §1.136(a). Applicants believe that no further fees for net addition of claims are required at this time. Any fees required for extensions of time and any fees for the net addition of claims are hereby authorized to be charged to our Deposit Account No. 503310.

Conclusion

Applicant submits that a full and complete response has been made to the pending Office Action and respectfully submits that all of the stated objections and grounds for rejection have been overcome or rendered moot. Accordingly, Applicant respectfully submits that all pending claims are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is thus respectfully requested to pass the above application to issue.

Should the Examiner feel that there are any issues outstanding after consideration of this response; the Examiner is invited to contact the Applicant's undersigned representative at the number below to expedite prosecution. Prompt and favorable consideration of this Reply is respectfully requested. Applicant respectfully requests that a timely Notice of Allowance be issued for this application.

Respectfully submitted,

Philip D. Lane
Reg. No. 41,140

Date: February 1, 2007

Philip D. Lane
P.O. Box 79318
Charlotte, NC 28271-7063
Tel: 704-301-5007
Fax: 704-843-2318